

NGV Technology Efforts: Biogas for Transportation

**Natural Gas Vehicle Technology Forum
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**Presented by:
Jon Lear, Ruby Mountain Inc.**

Purpose of the Study

Assess what role low-quality biomethane recovered from landfills, wastewater treatment plants and dairies can play in meeting the energy needs of the US transportation sector

Biomethane From Landfills

USEPA Landfill Methane Outreach Program (“LMOP”) program tracks US biomethane projects

- 1754 “Active” landfills in US (USEPA, 2007)

Rule of Thumb: one pound of MSW in a landfill will generate .1 SCF of landfill gas per year

Recovered landfill gas is typically :

- 50% methane

- 500-600 BTUs/SCF

Majority of landfill gas recovery projects in US use biomethane to produce electricity (USEPA LMOP, 2007)

- 519 electricity generation projects (72%)

- 199 direct use (28%)

A few transportation projects are operational or under construction

Landfill Biomethane for Transportation:

LA County CA-Puente Hills Landfill

-1500 DGE/day CNG (decommissioned-2007)

Sonoma County CA-Central Disposal Site

- 620 DGE/day ramping to 5000 DGE/day CNG (under construction-2009)

Orange County CA-Bowerman Landfill

-5000 DGE/day LNG (operational-2007)

SWACO-Franklin County OH

-685 GGE/day CNG (operational-2008)

Waste Management-Altamont CA Landfill

-13,000 LNG gallons/day (under construction-2009)

AVERAGE OUTPUT-All Projects = approx. 5000 DGE/day

Opportunities:

Landfills >2 million tons in place, close to markets and in active operation may be greatest opportunity

1.1m SCF landfill gas/day

4700 DGE/day

365 Active Landfill Sites in LMOP database capable of producing 5000 DGE/day from recovered biomethane

Challenges:

Infrastructure: Gas Collection

Technology: Gas Cleanup, Small Scale Liquefaction

Economics: Capital costs (biomethane recovery, gas cleanup, liquefaction), cost benefit vs. onsite electrical generation

End Users: Proximity of NG fleet operators, viability of off-site fuel transport

Biomethane From Wastewater Treatment Plants (WWTPs)

16,000 wastewater treatment plants (USEPA, 2007)

Rule of Thumb: 100 gallons of wastewater will generate 1 SCF of digester gas (biomethane) per day with use of digester

Recovered WWTP digester gas is typically :

- 60+% methane

- 550-600 BTUs/SCF

USEPA Combined Heat & Power (“CHP”) program tracks WWTP gas recovery projects that use biomethane to produce electricity or for onsite heating

- 544 WWTPs > 5 million gallons/day have digesters

- 76 of those use digester gas for onsite and/or offsite energy needs

No projects identified that use recovered gas for transportation

Opportunities:

Cities >1 million population may be greatest opportunity

- 100m gallons of wastewater

- 1m SCF digester gas/day

- 4300 DGE's day

Examples include:

- NYC-14 WWTPs-1482m gallons wastewater/day

- LA-Hyperion WWTP-360m gallons wastewater/day

- LACSD-3 WWTPs-344m gallons wastewater/day

Challenges:

Infrastructure: Digester/Gas Collection

Technology: Gas Cleanup, Small Scale Liquefaction

Economics: Capital costs (digester, gas cleanup, liquefaction), cost benefit vs. onsite electrical generation

End Users: Proximity of end user, viability of off-site fuel transport, onsite heat and electricity needs vs. off-site markets

Biomethane From Agricultural Operations

7000 large scale dairy and swine operations may be good candidates for biomethane recovery projects (USEPA)

Rule of Thumb: 1 pound of manure will generate 1 SCF of biomethane per day with use of digester

Recovered digester gas is typically :

- 55-65% methane

- 600 BTUs/SCF

USDA/USEPA/USDOE “Agstar” program tracks biomethane recovery projects at large scale agricultural facilities

- 111 sites have digesters in place

- Most use recovered biomethane to generate electricity

- Several projects transfer gas to pipeline or have other direct use

No projects identified that use recovered gas for transportation

Opportunities:

Large number of swine and dairy operations across the US offer untapped energy resource

Dairies with several thousand cows per facility may be greatest opportunity

Challenges:

Infrastructure: Facility must have manure collection system, digester

Technology: Gas cleanup, small scale liquefaction

Economics: Capital costs (digester, gas cleanup, liquefaction)

End Users: Proximity to markets

Study will be completed January 2009 and available to the public. Highlights include:

- Data and information from existing and planned transportation projects at landfills (LACSD-Puente Hills, Altamont)**
- Report on gas recovery experience at WWTP and Dairy and applicability to transportation markets (LACSD-Joint WPCP, Whitesides Dairy-Idaho)**

**For more information, contact
Jon Lear, Ruby Mountain Inc.
(801) 560 7915 or Rubymt@aol.com**

THANK YOU!